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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/620,162	07/20/2000	Thomas H. Baum	249-Div.	2598

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EXAMINER	
MARKHAM, WESLEY D	

ART UNIT	PAPER NUMBER
1762	

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Please find below and/or attached an Office communication concerning this application or proceeding.

MF-3

Office Action Summary	Application No.	Applicant(s)	
	09/620,162	BAUM ET AL.	
	Examin r	Art Unit	
	Wesley D Markham	1762	

-- The MAILING DATE of this communication appears on the cover she t with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-22 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-22 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 20 July 2000 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Acknowledgement is made of applicant's preliminary amendment A, filed as paper #2 on July 20, 2000, in which Claims 23 – 26 were canceled. Claims 1 – 22 are currently pending in U.S. application serial # 09/620,162, and an Office Action on the merits follows.

Claim Objections

1. Claim 15 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Specifically, Claim 15 recites a specific strontium precursor (i.e., $Sr(thd)_2$). Claim 14, from which Claim 15 depends, recites a calcium precursor (i.e., $Ca(thd)_2$) but does not recite the aforementioned strontium precursor.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claim 6 is rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for forming doped A-site deficient manganate films on a

substrate, the manganate films having an MnO_3 portion, does not reasonably provide enablement for the manganate materials recited in Claim 6, specifically LaMgMnO, LaCaMnO, LaSrMnO, and LaBaMnO. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention commensurate in scope with these claims. Specifically, the applicant's specification is not enabled for forming manganate materials wherein the manganate component is represented by "MnO" (i.e., only one oxygen atom per Mn atom). The applicant's specification is enabled for forming manganate materials wherein the manganate component is represented by "MnO_3" (i.e., three oxygen atoms per Mn atom). For the purposes of examination only, the examiner has broadly interpreted the manganate materials of Claim 6 to include any manganate materials having the recited components in any proportion, so long as the materials are A-site deficient as required by independent Claim 1.

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 1 – 22 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
6. Specifically, the term "thin" in Claims 1, 6, and 17 – 22 is a relative term which renders the claims indefinite. The term "thin" is not defined by the claims, the

specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. It is unclear how "thin" the film must be to qualify as a "thin film".

7. Claim 17 recites the limitation, "(La+Ca) < 1.0". Claim 18 recites the limitation "0.5 < (La+Ca) < 0.99". Claim 19 recites the limitation, "(La+Sr) < 1.0". Claim 20 recites the limitation "0.5 < (La+Sr) < 0.99". Claim 21 recites the limitation, "(La+Ba) < 1.0". Claim 22 recites the limitation "0.5 < (La+Ba) < 0.99". There is insufficient antecedent basis for these limitations in the claims. Specifically, Claim 1 from which Claims 17 – 22 depend does not recite any of the components mentioned in Claims 17 – 22 (i.e., La, Ca, Sr, and Ba).

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. Claims 1 – 4 and 6 – 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li et al. (USPN 5,487,356).

10. Regarding Claim 1, Li et al. teach a method of forming a doped manganate film on a substrate from corresponding precursors, the method comprising liquid delivery and flash vaporization thereof to yield a precursor vapor, and transporting the precursor

vapor to a CVD reactor for the CVD formation of the manganate film on the substrate (Abstract, Figure 1, and Col.7, lines 44 – 65, and Col.8, lines 30 – 52). Li et al. do not explicitly teach that the method is used to form an A-site deficient manganate film. However, Li et al. teach that their CVD method is used to deposit films having a giant magnetoresistance (GMR) effect, the films having the general formula $(La_{1-x}A_x)MnO_3$, wherein A is selected from the group consisting of Ba, Ca, Mn, and Sr (Abstract). In addition, Li et al. also teach that their CVD method is particularly attractive for forming these types of layers because it is readily scaled up to production runs and the control of key variables such as oxygen partial pressure during deposition, film stoichiometry, and film thickness is most feasible with CVD (Col.2, lines 52 – 65). Further, Li et al. teach that films having the general formula $(La_{0.72}Ca_{0.25})MnO_3$ (i.e., A-site deficient manganate films) are known in the art to exhibit a GMR effect and have previously been deposited by PVD methods such as sputtering and laser ablation (Col.2, lines 38 – 51). It would have been obvious to one of ordinary skill in the art to deposit the $(La_{0.72}Ca_{0.25})MnO_3$ film (i.e., an A-site deficient manganate film) taught by Li et al. using the CVD method of Li et al. with the reasonable expectation of (1) success, as Li et al. teach that films having the general formula $(La_{1-x}A_x)MnO_3$ are successfully deposited by their method and that their method is most feasible for controlling film stoichiometry, and (2) obtaining the benefits of using the CVD method of Li et al. to deposit the manganate film, such as ease of scaling up to production runs, high control of key

process variables, and the ability to coat a wide variety of substrate geometries (Col.2, lines 38 – 65).

11. Li et al. teach all the limitations of Claims 2 – 4 and 6 – 18 as set forth above in paragraph 10 and below, including a method wherein:

- Claim 2 – The precursors comprise coordination compounds, or Lewis base complexes of the same, of metals selected from the group consisting of lanthanum, magnesium, calcium, strontium, barium, and manganese (Col.4, lines 12 – 68, Col.5, lines 1 – 45 and 65 – 67, and Col.6, lines 1 – 40).
- Claim 3 – The precursors include metal β-diketonate compounds, metal pivalate compounds, or Lewis base complexes thereof (Col.6, lines 1 – 25, and Col.8, lines 30 – 52).
- Claim 4 - The precursors include metal fluorinated β-diketonate compounds, or Lewis base complexes thereof (Col.6, lines 6 – 7).
- Claim 6 – The manganate material is selected from the group consisting of LaMgMnO, LaCaMnO, LaSrMnO, and LaBaMnO (Col.2, lines 38 – 51).
- Claim 7 – The precursors are dissolved in a solvent and flash vaporized at a temperature of from about 100° C to about 300° C (Col.6, lines 11 – 26, Col.7, lines 30 – 42, and Col.8, lines 30 – 52). Specifically, Li et al. teach that a vaporizer temperature of 220° C is suitable (Col.7, line 37).
- Claim 8 – The precursor vapor is transported to the CVD reactor in a carrier gas (Col.7, lines 30 – 57, and Col.8, lines 30 – 52).

- Claim 9 – The carrier gas is selected from the group consisting of argon, nitrogen, neon, helium, and ammonia (Col.6, lines 56 – 57, and Col.8, lines 47 – 48).
- Claim 10 – The carrier gas is mixed with an oxidizing co-reactant gas (Col.6, lines 56 – 63, and Col.7, lines 44 – 56).
- Claim 11 – The substrate is heated to a temperature in the range of about 300° C to about 1000° C (Col.7, lines 24 – 30, and Col.8, lines 49 – 51).
- Claim 12 – The pressure of the precursor vapor in the CVD reactor is from about 0.1 to about 760 torr. Specifically, Li et al. teach reactor pressures of about 1.5 Torr (Col.7, line 35, and Col.8, lines 49 – 50).
- Claim 13 – The CVD is plasma-assisted (Col.7, lines 56 – 59).
- Claim 14 – The precursors comprise a compound selected from the group consisting of $La(thd)_3$, $Ca(thd)_2$, and $Mn(thd)_3$ (Col.8, lines 30 – 45).
- Claim 15 – The precursors comprise a mixture of the compounds selected from the group consisting of $La(thd)_3$, $Sr(thd)_2$, and $Mn(thd)_3$ (Col.8, lines 30 – 45). Specifically, Li et al. teach a mixture comprising $La(thd)_3$ and $Mn(thd)_3$.
- Claim 16 – The precursors comprise a mixture of Lewis base adducts of metal β-diketonate precursors (Col.6, lines 1 – 10 and 27 – 40).
- Claim 17 – (La+Ca) < 1.0 in the A-site deficient manganate film (Col.2, lines 42 – 45).

- Claim 18 – 0.5 < (La+Ca) < 0.99 in the A-site deficient manganate film (Col.2, lines 42 – 45).

12. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Li et al. (USPN 5,487,356) in view of Vaartstra (USPN 6,010,969) and Biagini et al. (USPN 5,659,101).

13. Li et al. teach all the limitations of Claim 5 as set forth in paragraph 10 above, except a method wherein the precursors include metal pivalate Lewis base adducts. However, Li et al. do teach that suitable ligands that are used in the metal / ligand precursors of their invention include beta-diketonates. In addition, Li et al. teach that Lewis base complexing components that coordinate with the metal centers of the precursors are used to increase the volatility of the source reagents and to facilitate their transport to the CVD reactor (Col.6, lines 1 – 10 and 27 – 40). Vaartstra teaches that, in the art of forming oxide films by flash vaporization CVD on a substrate (Col.1, lines 40 – 58, Col.2, lines 1 – 8, and Col.3, lines 1 – 45), it was known at the time of the applicant's invention to use carboxylate ligands such as pivalate ligands in metal-containing CVD precursors (Col.3, lines 46 – 57). Other ligands such polyamines (i.e., a Lewis base compound) can also be complexed to the metal to increase the precursor's volatility (Col.3, lines 58 – 67). Vaartstra also teaches that a wide variety of metals can be successfully complexed with the carboxylate ligands (Col.5, lines 52 – 61). Biagini et al. teach the functional equivalence of ligands such as acetylacetonate and hexafluoroacetylacetonate (i.e.,

ligands taught by Li et al. for use in their CVD process) and pivalate ligands (Col.3, lines 39 – 53). It would have been obvious to one of ordinary skill in the art to utilize metal pivalate Lewis base adducts as taught by Vaartstra as the precursors in the CVD process of Li et al. with the reasonable expectation of success and with the expectation of similar results (i.e., forming the manganate film on a substrate).

14. Claims 19 – 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Li et al. (USPN 5,487,356) and Munakata et al. (USPN 6,060,420).

15. Li et al. teach all the limitations of Claims 19 – 22 as set forth in paragraph 10 above, except a method wherein the A-site deficient manganate film comprises La and Sr (Claims 19 – 20) or La and Ba (Claims 21 – 22), and wherein $0.5 < (La+Sr) < 0.99$ and $0.5 < (La+Ba) < 0.99$. Li et al. do teach their method is used to make manganate films having the general formula $(La_{1-x} A_x)MnO_3$, wherein A is selected from the group consisting of Ba, Ca, Mn, and Sr (Abstract) (i.e., films identical to the films claimed by the applicant except for the A-site deficiency). The only explicit teaching in Li et al. of an A-site deficient material is of a manganate material comprising La and Ca, not La and Sr or La and Ba. Munakata et al. teach the formation of A-site deficient oxides including manganates. The A-site comprises at least one element selected from the group consisting of La, Ba, Sr, and a number of other metals (Col.3, lines 35 – 67). A specific example provided by Munakata et al. is an A-site deficient manganate film comprising La and Sr. As Munakata et al. teach that the A-site comprises at least one element selected from the group

consisting of La, Ba, Sr, and a number of other metals and that the film may be a manganate film (Col.3, lines 44 – 67), it would have been obvious to one of ordinary skill in the art to choose the A-site of the manganate film of Munakata et al. to comprise either La and Ba or La and Sr, as these combinations are simply specific combinations of the genus of combinations taught by Munakata et al. Munakata et al. also teach that the A-site deficient amount is as high as 0.2 (i.e., the values of La+Ba and La+Sr can be as low as 0.80) (Col.4, lines 48 – 65). Therefore, Munakata et al. teach / suggest the A-site deficient manganate materials claimed by the applicant in Claims 19 – 22. It would have been obvious to one of ordinary skill in the art to form the A-site deficient materials of Munakata et al. using the CVD process of Li et al. with the reasonable expectation of (1) success, as Li et al. teach that films having the general formula $(La_{1-x}A_x)MnO_3$ are successfully deposited by their method and that their method is most feasible for controlling film stoichiometry, and (2) obtaining the benefits of using the CVD method of Li et al. to deposit the manganate film, such as ease of scaling up to production runs, high control of key process variables, and the ability to coat a wide variety of substrate geometries (Col.2, lines 38 – 65).

Conclusion

16. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Jin et al. (USPNs 5,411,814 and 5,461,308) teach various A-site deficient manganate materials that have improved magnetoresistive properties.

17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wesley D Markham whose telephone number is (703) 308-7557. The examiner can normally be reached on Monday - Friday, 8:00 AM to 4:30 PM.

18. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive Beck can be reached on (703) 308-2333. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

19. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Wesley D Markham
Examiner
Art Unit 1762

WDM
November 26, 2001

BRET CHEN
PRIMARY EXAMINER